5 sin $\sqrt{2}$ cos $\sqrt{3}$ tan 9 x^y log

UNITREX

mini handy 80SR

INSTRUCTION BOOKLET

Welcome to your purchasing UNITREX MINI HANDY 80SR. This is a very compact high-performance electronic calculator with 13 types of technical calculation circuits and an 8-figure memory. Your perfect knowledge of this machine will assure you of full use of various functions as a powerful means for troublesome calculations.
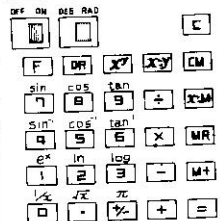
CONTENS

SPECIAL FEATURES

- It makes possible 13 types of technical calculations.
- Function calculations can be switched over from degree to radian and vice versa.
- Provided with an 8-figure memory.
- Calculations are possible just in the same order of the formula.
- It employs an underflow system which gives an approximate answer in up to 16 figures.
- A full floating decimal system is adopted.
- Positive or negative sign can easily be changed over with the sign change key.
- Auto-constant circuit is provided.

UNITREX
MINI HANDY 80SR

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 12345678
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OFF ON DEG RAD

F	DR	x^y	x-y	CM
sin	cos	tan		
7	8	9	÷	x-M
sin⁻¹	cos⁻¹	tan⁻¹		
4	5	6	×	MR
e^x	ln	log		
1	2	3	−	M+
1/x	√x	π		
0	·	%	+	=

C	Clear key:	Depressing this key once deletes the wrong entry only. Depressing it twice makes all figures cleared, except for the contents in the memory. This key is also available when releasing an overflow error.
CM	Clear memory key:	This key is used to delete an entry in the memory.
x·*M	Memory display exchange key:	Used to exchange a displayed number (x register) for the number in the memory. This key is useful when checking a total in the memory in the middle of calculation. Calculation can proceed when it is depressed again.
MR	Memory recall key:	Used to obtain the result of memory calculation.
M·	Memory plus key:	Used to add the displayed number to the memory. When the displayed number is negative, subtraction from the memory is possible by means of this key.
x·*y	Display exchange key:	Used to exchange a displayed number (x register) for the number (y register) contained inside the machine. Example: 4 : (2·6) 0.5 2 · 6 : 4 x·*y

In this way the numerator and the denominator in division can be exchanged for convenience of a series of operation.

$\boxplus$ $\boxminus$ $\boxtimes$ $\boxdiv$ $\boxminus$ operation keys

$\boxed{x^y}$ power key: This key is used for the calculation of $x^y = e^{y \ln x}$. The result is always given in the approximate value. The value x should be a positive number, while y can be any real number.

Important: Except for $\boxed{x^y}$ key, all the following technical calculations will produce errors within the range of ± 1 at the 6th figure as seen from the left side.

$\boxed{F}$ Function key: This key is used to start technical calculations. For example, $\sqrt{5}$ can be obtained after the operation: 5 $\boxed{F}$ $\boxed{\cdot}$. The value of sin 45° can be obtained by the operation of 45 $\boxed{F}$ $\boxed{7}$ in the setting $\boxed{\blacksquare}$. The F lamp (.) lights at the end of the display when this key is depressed.

$\boxed{\cdot}$ Decimal point, root key: Generally used to put an entry which contains a decimal point. However, root calculation is possible with this key after $\boxed{F}$ key has been depressed.

$\boxed{\pm}$ Sign change π key: Generally used to convert a positive number into a negative one and vice versa. The value of π is displayed if this key is depressed after depressing $\boxed{F}$ key.

$\boxed{0}$ — $\boxed{9}$ Entry, technical calculation key: Generally used to put a necessary entry in the machine. However, respective technical calculations are carried out for the displayed numbers if these keys are used after depressing $\boxed{F}$ key.

$\boxed{DR}$ Display recall key: If $\boxed{F}$ key is not depressed by mistake and the associated keys for technical calculations are depressed, this key is used to make a correction.
Example: tan 54° $\boxed{\blacksquare}$ 54 $\boxed{9}$ $\boxed{DR}$ $\boxed{F}$ $\boxed{9}$

● Overflow Error

When the result of general calculation exceeds 9 figures, the mark ( ) of the overflow error (simply called error hereafter) is lit and higher 8 figures are displayed. Except for .C. key, all other keys are locked electrically. In this case, the decimal point indicated at a certain figure from the left end of the display means that the number of the figures above the decimal point is equal to that of the lower figures to be omitted.

Example: 99999999 x 9999   999899990001
99999999 ⎟× 9999 ⎟   ⎟ 9998.9999

Namely, the lower four figures 0001 are omitted and the higher 8 figures only are displayed. In the case of minus calculation, an overflow is indicated by the mark (..).

An error condition also appears if mathematically unacceptable numbers are put in technical calculations.

Example: x | ⩾ 1 for Sin x and Cos x
e exceeding the quantity 10 1
x ⩾ 0 for ln x and log x
x < 0 for √x
x 0 for 1 x
x = 0 or y > ln 99999999
                    ln x

In this case the error mark " ⎟" is lit at the left end of the display and "0." at the right end.

● **General Arithmetic Operations**

General arithmetic operations are possible by operating the associated keys in the same order of formulas.   If an operation key is depressed by mistake, successive calculation conforms to the key depressed later.

Example)   A + B − C D   A ⎟ B ⎟+⎟,⎟−⎟ C ⎟ D
A : B = C   A ⎟×⎟ B ⎟ C

ADDITION & SUBTRACTION

EXAMPLE	OPERATION & DISPLAY	
12.5 + 260 = 272.5	12.5 ⎟ 260 ⎟	272.5
		Minus lamp is lit
18.6 − 256 = − 237.4	18.6 ⎟ 256 ⎟=⎟	237.4
150 · 150 + 150 450	150 ⎟⎟ ⎟ ⎟	450

MULTIPLICATION & DIVISION

5.25 × 280 1470	5.25 ⎟×⎟ 280 ⎟ ⎟	1470
1470 ÷ 280 = 5.25	1470 ⎟÷⎟ 280 ⎟=⎟	5.25

POWER CALCULATION

5^3 $= 125$	
$\frac{1}{5^3}$ $= 0.008$	

5 $\boxed{\times}$ $\boxed{=}$ $\boxed{=}$	125
5 $\boxed{\div}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$	0.008

CONSTANT CALCULATION

$280 \times 15 = 4200$	
$280 \times 38 = 10640$	
$280 \times 26 = 7280$	
$4200 \div 25 = 168$	
$38.5 \div 25 = 1.54$	
$0.644 \div 25 = 0.02576$	

280 $\boxed{\times}$ 15 $\boxed{=}$	4200
38 $\boxed{=}$	10640
26 $\boxed{=}$	7280
4200 $\boxed{\div}$ 25 $\boxed{=}$	168
38.5 $\boxed{=}$	1.54
0.644 $\boxed{=}$	0.02576

*For constant multiplication, the multiplicand (the number to be multiplied by another) is automatically set as a constant. For constant division, the divisor (the quantity by which another is to be divided) is set automatically. For addition or subtraction, the addition or subtraction number is set as a constant.

● Memory Calculation

The memory allows for storage of a result or an entry while still retaining the normal functions of the calculator.

PRODUCT ADDITION & SUBTRACTION

$286 \times 45 = 12870$	
$3780 \times 250 = 945000$	
$+) - (550 \times -3.6) = 1980$	
$\overline{955890}$	

$\boxed{CM}$ 286 $\boxed{\times}$ 45 $\boxed{=}$ $\boxed{M+}$	12870
3780 $\boxed{\times}$ 250 $\boxed{=}$ $\boxed{M+}$	945000
550 $\boxed{\times}$ 3.6 $\boxed{=}$ $\boxed{+/-}$ $\boxed{M+}$	- 1980
$\boxed{MR}$	955890

*For subtraction from the memory, the displayed number is attached with a minus mark by the use of $\boxed{+/-}$ key. Then the value can be put by depressing $\boxed{M+}$ key. When the displayed number is negative in the beginning, $\boxed{+/-}$ key need not be used, but $\boxed{M+}$ key only is to be depressed.

CONSTITUTIONAL RATIO CALCULATION

What is respective constitutional ratios
of 100, 300, 160, 220. and 20
against the total?

100 - 300 + 160 - 220 + 20   800

For 100:	12.5%
For 300:	37.5%
For 160:	20%
For 220:	27.5%
For 20:	2.5%

|CM| 100 [M⁺] 300 M⁺
160 M⁺ 220 M⁺ | 20 M⁺

100 [÷] MR |=| 0.125
300 ⁻⁻ 0.375
160 = 0.2
220 |=| 0.275
20 |=ˈ 0.025

● Technical Calculations

This calculator is provided with 13 functions of technical calculations. Except for the calcula-
tion of x , the results of the required technical calculations can be obtained by operating
the associated keys after deprssing $\overline{F}$ key. (The F lamp is lit.)

POWER CALCULATION : x

5⁺	5 x 3	125
5 ⁺	5 x 3	0.008

Numeral range: $0 \leq x \leq 10$ 1 and y $\leq \frac{\ln 10^1}{\ln x}$

Important: The next key should not be depressed until the display appears after depressing
x key. If keys are depressed too quickly, a wrong answer may be obtained.

EXPONENTIAL CALCULATION: e^x

e^x	3 $\boxed{F}\boxed{e^x}$	20.08553
$e^{-2.5}$	2.5 $\boxed{+/-}\boxed{F}\boxed{e^x}$	0.082085

Numeral range: Operation result $\leq 10^4 - 1$ or $|x| \leq 18.4$ (approx.)

INVERSE NUMBER CALCULATION: 1/X

$\dfrac{1}{4 \times 5}$	4 $\boxed{\times}$ 5 $\boxed{=}\boxed{F}\boxed{1/x}$	0.05
$\dfrac{1}{5^3}$	5 $\boxed{x^3}$ 3 $\boxed{=}\boxed{F}\boxed{1/x}$	0.008

ROOT CALCULATION: $\sqrt{x}$

$\sqrt{5}$	5 $\boxed{F}\boxed{\sqrt{x}}$	2.2360679
$\sqrt{3^2 + 4^2}$	3 $\boxed{\times}\boxed{=}\boxed{M+}$ 4 $\boxed{\times}\boxed{=}\boxed{M+}\boxed{MR}\boxed{F}\boxed{\sqrt{x}}$ 5

Numeral range: $x > 0$

CIRCULAR CONSTANT π

$15\,\pi$	15 $\boxed{\times}\boxed{F}\boxed{\pi}\boxed{=}$	47.123889
$5^2\,\pi$	5 $\boxed{\times}\boxed{=}\boxed{\times}\boxed{F}\boxed{\pi}$	78.539815

* $\boxed{\sqrt{x}}\boxed{1/x}$ keys only make possible a continuous operation with other technical calculations.

Example) $\sin a \times \dfrac{1}{b}$ a $\boxed{F}\boxed{\sin}\boxed{\times}$ b $\boxed{F}\boxed{1/x}\boxed{=}$ $\sin a \times \dfrac{1}{b}$

$\sin a \times \cos b$

(Correct)   a $\boxed{F}\boxed{\sin}\boxed{M+}$ b $\boxed{F}\boxed{\cos}\boxed{\times}\boxed{MR}\boxed{=}$ $\sin a \times \cos b$

(Wrong)   a $\boxed{F}\boxed{\sin}\boxed{\times}$ b $\boxed{F}\boxed{\cos}\boxed{=}$ $\cos b$

TRIGONOMETRIC FUNCTIONS: sin X, cos X, tan X

By the use of the change-over switch lever, calculation can be expressed in either degrees or radians.

sin 30°	DEG ▪ RAD	30 $\boxed{F}\boxed{\sin}$	0.5
tan 30°	DEG ▪ RAD	30 $\boxed{F}\boxed{\tan}$	0.57735
sin 30° × cos 30°	DEG ▪ RAD	$\boxed{CM}$ 30 $\boxed{F}\boxed{\sin}\boxed{M+}$	
		30 $\boxed{F}\boxed{\cos}\boxed{\times}\boxed{MR}\boxed{=}$	0.433013
$\cos \dfrac{3\pi}{2}$	DEG ▪ RAD	3 $\boxed{\div}$ 2 $\boxed{=}\boxed{\times}\boxed{F}\boxed{\pi}\boxed{=}\boxed{F}\boxed{\cos}$	0.99662

sin 31°35′40″

For calculation to the units of minutes and seconds, each unit must be converted into the unit of degrees.

Numeral range: $|x| \leq 10^2$

	DEG	RAD								
	■		CM	3	M−	35	÷	60		M−
	40	÷	3600		M−	MR	F	sin		
										0.523903

INVERSE TRIGONOMETRIC FUNCTIONS : $\sin^{-1} x$, $\cos^{-1} x$, $\tan^{-1} x$

In the same manner as for trigonometric functions, the use of the change-over switch lever makes possible calculations in either degrees or radians.

$\sin^{-1} 0.5$

	DEG	RAD				
	■		0.5	F	sin	30°

$\cos^{-1} 0.866$

	DEG	RAD				
	■		0.866	F	cos	0.523649

Numeral range : $|x| \leq 1$

Principal value range : $-90° (-\pi/2 \text{ rad}) \leq \sin^{-1} x \leq 90° (\pi/2 \text{ rad})$
$0° (0 \text{ rad}) \leq \cos^{-1} x \leq 180° (\pi \text{ rad})$

$\tan^{-1} 60$

	DEG	RAD			
	■		60	F	tan	89.04516

Numeral range : $\frac{1}{10^2} \leq |x| \leq 10^2 - 1$ or $x = 0$

Principal value range : $-90° (-\pi/2 \text{ rad}) < \tan^{-1} x \leq 90° (\pi/2 \text{ rad})$

$\tan^{-1} (\sin 45° + \cos 45°)$

	DEG	RAD						
	■		CM	45	F	sin	|x|	M+
			45	F	cos	÷	+/−	M+
			MR	F	tan			45.00001

∗ Hyperbolic Sine, Cosine, Tangent : $\sin hx$, $\cos hx$, $\tan hx$. There is no exclusively available key for these calculations. However, the results are obtainable in the following principles of hyperbolic functions :

$$\sin hx = \frac{e^x - e^{-x}}{2} \qquad \cos hx = \frac{e^x + e^{-x}}{2} \qquad \tan hx = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$

∗ Conversion between Degrees and Radians

$$180° = \pi \text{ radian} \qquad 1 \text{ rad} = \frac{180°}{\pi} \qquad 1° = \frac{\pi}{180}$$

sin h0.5 0.5 F e^x F $1/x$ $\div$ 2 0.5210944

COMMON & NAPERIAN LOGARITHMS: log x, ln x

8 log 30   30 F log $\times$ 8 $=$ 11.816976

5 ln 100   100 F ln $\times$ 5 $=$ 23.02585

Numeral range: $10^{-1} \leq x \leq 10^{?} - 1$

Battery power

Open the cover of the battery compartment on the bottom of the unit and insert three batteries to match the polarity as per drawing. Close the cover and slide the power switch "ON"

MAINTENANCE INSTRUCTION

This calculator is made up of precision parts such as LSI. Radical changes in temperature or humidity can be harmful. The following points must be carefully noted.

1. Do not drop or jar the machine.
2. Always be certain machine is switched "OFF" when not in operation. This will prevent unnecessary drain on the batteries.
3. Long hours of direct heat rays from the sun or an appliance must be avoided.
4. When cleaning the machine, use a neutral cleaner. Do not use a wet cloth or liquid such as paint thinner.